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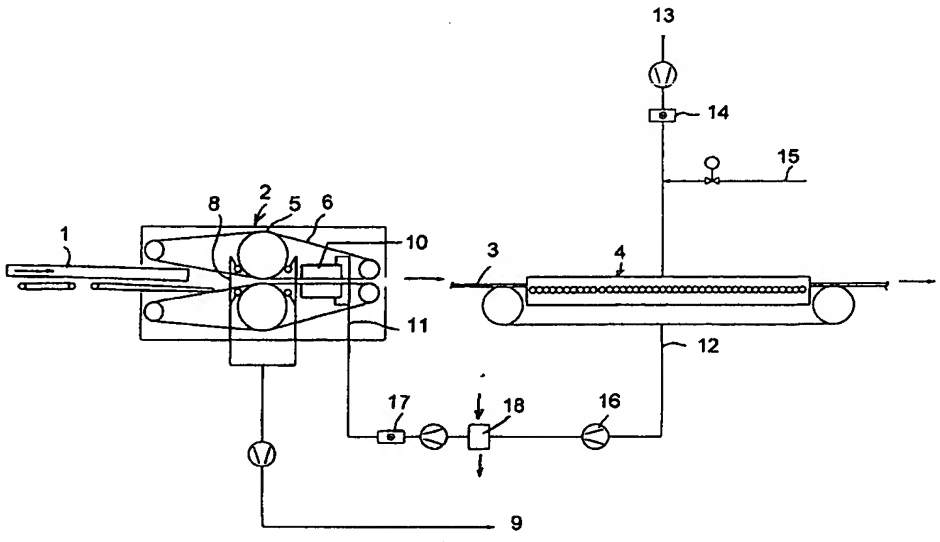

(57) Abstract

The present invention relates to a method and to an arrangement for the continuous production of lignocellulosic boards, wherein material is disintegrated into particles and/or fibres, glued, dried and formed into a mat (1). The mat is pressed in a continuous steam-injection press (2) into board form (3) and then passed through an after-conditioning unit (4). Gaseous emissions and steam occurrent in the press process are captured. Hot air is supplied to prevent condensation of the gaseous emissions and the steam when leakage air from the surroundings is admixed therewith and also to transport the steam and emissions to a combustion plant for combustion.

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METHOD AND ARRANGEMENT FOR THE CONTINUOUS PRODUCTION OF LIGNOCELLULOSE-CONTAINING BOARDS

The present invention relates to a method of producing continuously lignocellulosic boards in accordance with the preamble of claim 1, and to an arrangement for carrying out the method.

Methods of producing boards from lignocellulose-based raw materials are well known to the art and have found wide use in practice. The manufacture of such boards includes the following main method steps: disintegration of the raw material to fibres and/or particles of appropriate size, drying the particles and/or fibres to a determined moisture ratio and gluing the material either prior to or subsequent to said drying process, shaping the glued material to form a mat, which may comprise several layers, and optionally cold pre-pressing the mat, pre-heating said mat, water-spraying mat surfaces etc., and heat pressing the mat in a discontinuous press or in a continuous press while subjecting the material simultaneously to pressure and heat so as to obtain a finished board.

A well-known problem with present day manufacturing technology, irrespective of whether it involves discontinuous presses or continuous presses, is that gases are generated in the press during the compression process, which takes place at high temperatures. These gases consist of water vapour (steam), different volatile substances dissolved from wood and glue, so-called Volatile Organic Compounds (VOC), and gaseous phenol from wood and glue, etc. It has been found that long-time exposure to these substances results in irritation, and that they are also harmful to personal health when present in sufficiently high concentrations. Consequently, the authorities in the majority of countries in which boards are manufactured in accordance with the aforesaid methods have elaborated a set of rules and regulations that state the emission concentrations that are permitted in work places and the permitted concentrations permitted in emissions to atmosphere.

Since present day press technology involves the use of homogenous heating plates or steel bands, only a minor part of the gases generated in press will leave the boards through their edges in the compression process. However,

the major part of these gases will leave the board as it exits from the press. The influence of these gases on the working environment can be limited to some extent with the aid of protective casings and covers, although air at room temperature is normally used as transport air because of the large size of the presses. Consequently, this air volume will normally exceed the requirement of combustion air in the standard heating plant of the factory. This has necessitated the installation of complicated and expensive equipment in connection with the majority of plants in which lignocellulosic sheets and boards are produced. For instance, the plants will normally include so-called RTO (Regenerated Thermal Oxidizer) units or scrubber systems for purifying press gases.

The object of the present invention is to provide a method and an arrangement for producing lignocellulosic boards without VOC-emissions or formaldehyde-emissions to the workshop areas concerned and to the ambient environment, and also obviating the need to install expensive purification equipment. This object is achieved with a method and an arrangement according to the invention that have the characteristic features set forth in respective claims.

The invention will now be described in more detail with reference to the accompanying drawing, which is a schematic longitudinal section view of an arrangement in accordance with the invention.

The plant illustrated in the drawing is based on the plants disclosed in SE 502 272 and SE 504 638, which describe two continuous steam-press processes. A fibrous mat 1 previously formed in the manufacturing process is compressed in a continuous steam-injection press 2 to form a board or sheet 3, which is then passed through an after-conditioning unit 4. As the fibre mat 1 passes into the nip between two steam-injection rolls 5, steam is delivered and injected into the mat through wires 6. The temperature rises very quickly to above 100°C; a typical temperature is above 120°C. The mat is herewith formed into a solid board 3. The pressure falls as the board leaves the nip between the steam-injection rolls 5, and the temperature therewith drops very quickly to about 100°C. This takes place by virtue of the extremely rapid vaporisation of part of the enclosed moisture. VOC-emissions and formaldehyde-emissions accompany the departing steam.

Because this process takes place between two gas-permeable wires 6, the steam and the gases departing with the steam are able to leave the board across the whole of its width. Steam and other emissions are captured before being able to escape into the workshop area or to ambient atmosphere, by a suction unit 8 provided to this end inside the press. Air heated to a temperature in excess of 100°C is transported to this suction unit. The hot air is used together with leakage air from the surroundings as a vehicle gas for the steam and said other emissions. The hot air, leakage air, steam and emissions are transported to a heating plant 9 in the factory, for combustion. A hot air delivery unit 11 is connected to a curing zone 10 in the press 2, and the hot air supplied is then passed to the suction unit 8.

The temperature is maintained at a high level partly to prevent the emissions and the steam from condensing out to the suction system and partly to utilize the fact that the moisture carrying capacity of the air, calculated per kilogram of air, increases with increasing temperatures. This enables the total air volumes and gas volumes to be maintained at levels which do not exceed the volumes of combustion air that are required by the standard plant system to generate the heat and process steam necessary for the production of such board material. Consequently, no other equipment need be installed to prevent emissions to the surroundings.

Subsequent to the board having been produced in the continuous steam injection press 2, the board is passed into the after-conditioning unit 4 (see SE 504 638) where a pre-determined volume of air heated to a pre-determined temperature and having a pre-determined moisture content is sucked through the board so as to obtain a desired board moisture content and temperature. The air leaving the after-conditioning unit will also contain emissions of VOC and formaldehyde, although in smaller quantities, measurements taken in a pilot plant have shown that the major part of the emissions occur in the continuous steam-injection press. For this purpose, a suction unit 12 is arranged in the after-conditioning unit 4. Air is sucked in at 13 and heated by a heater 14 and is supplied with steam through the conduit 15.

The air leaving the after-conditioning unit is transported to the hot air supply unit 11 of the steam-injection press 2 and its curing zone 10, by means of a suction fan 16. As it passes to the supply unit 11, the air is given additional energy through the medium of a heat exchanger 17. If the air from the after-conditioning unit 4 is in excess, the excess can be mixed with the flow from the press 2 in a closed hood 18 and passed to the heating plant 9. If there is a deficiency of air to the curing zone 10, the suction fan 16 draws-in extra air through the closed hood 18. The air leaving the after-conditioning unit 4 is thus used as hot input air for the internal suction unit 8 of the continuous steam-injection press. Measurements have shown that these volumes are sufficient to fulfil the requisite transport volumes needed for the continuous steam-injection press.

Subsequent to having passed through the after-conditioning unit 4, the board 3 may optionally also be passed through a surface-densifying press in accordance with SE 502 272 (not shown in the drawing). This latter press also includes a special suction unit that functions to capture in said press those emissions that are transported to the combustion plant of the factory with the aid of hot air, for the production of heat and steam.

CLAIMS

1. A method for the continuous production of lignocellulosic boards, in which the material is disintegrated into particle and/or fibre form, glued, dried and formed into a mat (1) which is compressed in a continuous steam-injection press (2) into board form (3) and the board is thereafter passed through an after-conditioning unit (4), **characterized** by capturing steam and gaseous emissions generated in the press process, and supplying hot air to said process for the purpose of preventing condensation of the gaseous emissions and said steam when admixing said emissions and steam with leakage air from the surroundings and also to prevent condensation of said leakage air from the surroundings, and for transporting the emissions to a combustion plant (9) for combustion.

2. A method according to claim 1, **characterized** in that the hot air and the leakage air from the surroundings are supplied in an amount which is at most equal to the amount of combustion air required by the heating plant (9).

3. A method according to claim 1 or 2, **characterized** by supplying to a curing zone (10) in the press (2) air that has a temperature in excess of 100°C.

4. A method according to any one of claims 1-3, **characterized** by supplying energy to the suction air from the after-conditioning unit (4) so that the temperature will exceed 100°C, and thereafter using the air as vehicle air for the transportation of emissions from the steam-injection press (2).

5. An arrangement for carrying out the method according to any one of claims 1-4, said arrangement including a continuos steam-injection press (2) and an after-conditioning unit (4), **characterized** by a suction unit (8) arranged in the steam-injection press (2) and functioning to capture gaseous emissions and steam and to transport said emissions and steam to a combustion plant (9), and further characterized by a unit (11) for supplying hot air to the suction unit (8).

6. An arrangement according to claim 5, **charact riz d** in that the hot air supply unit (11) is connected for air supply purposes to a suction unit (12) in the after-conditioning unit (4), and in that a heater (17) is connected to a transport conduit between said units.

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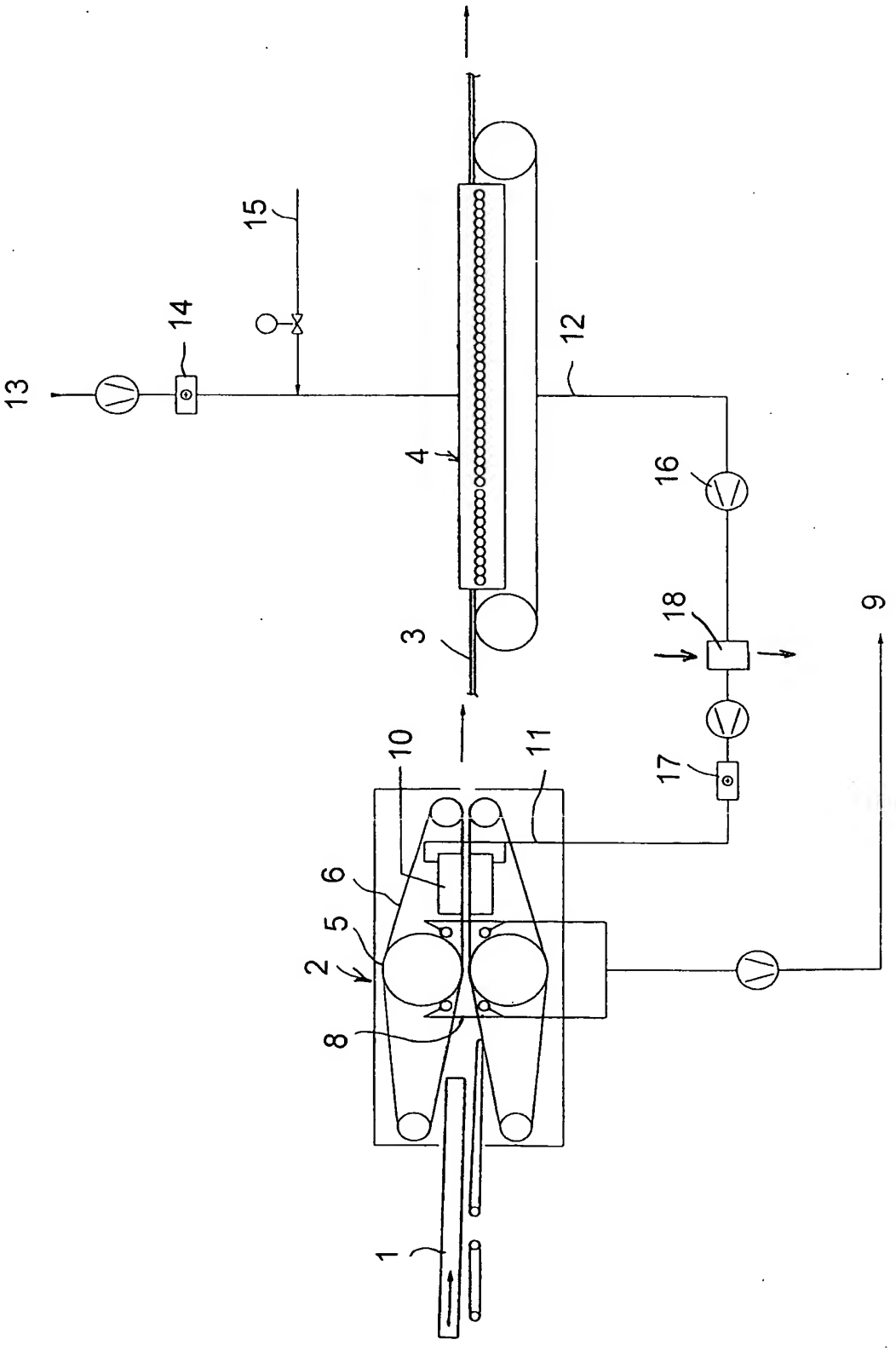

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B27N 3/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B27N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 502272 A (SUNDS DEFIBRATOR INDUSTRIES AB), 25 Sept 1995 (25.09.95) --	1
A	SE 9701652 A (SUNDS DEFIBRATOR INDUSTRIES AB), 31 October 1998 (31.10.98) --	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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